

What is claimed is:

1.- Apparatus for detecting gas combustion adapted to a domestic free-standing gas heater or a water heater  
5 provided with a safety valve (16), a main gas valve (7) and an electronic control unit, the detection apparatus (1) comprising,  
an mounting bracket (8) for supporting the detection apparatus (1') shaped for fitting on the gas heater or  
10 the water heater,  
a pilot burner (2) with at least one pilot flame (3) for faulty combustion detection, and an igniter (10) incorporated on the support bracket (8),  
a thermoelectric generator assembly (4-6) heated by the  
15 pilot flame (3), supplying through two electric outputs (12, 13) respectively a low voltage (Vb) for energizing said safety valve, and for detection of combustion deficiencies in the pilot flame (3), and a higher voltage (Vb) for powering the main valve and the electronic unit  
20 of the gas heater,  
wherein the thermoelectric assembly (4-6) is incorporated on said support bracket (8) forming a compact mounting unit with the pilot burner (2), and includes a flat thermoelectric cell (4) made up with semiconductor P-N  
25 junctions, with two sides one hot and one cold, in the form of plates (4h, 4c) spaced apart from each other, a heat transmitter element (5) licked by the pilot flame

and connected to the hot plate (4h), and a heat exchanger (6) connected to the cold plate (4c), wherein the heat transmitter element (5) is formed with a thermal head (5a) positioned on the support bracket (8) at a given  
5 distance (e) separating it from the pilot burner (2) for the rapid detection of the pilot flame (3), and with a heat transmission member (5b) connected to thermal head (5a) separating the flat cell (4) from the flame (3).

10 2.- The gas combustion detection apparatus according to claim 1, wherein said low detection voltage (Vd) generated by the thermoelectric assembly (4-6) is around 0.02 V open circuit or represents a short-circuit current of up to 150 mA to maintain the excitation of the safety  
15 valve electromagnet, and said high supply voltage (Vb) is higher than 1.2 V with a current of around 110 mA.

3.- The gas combustion detection apparatus according to claim 1, wherein the thermoelectric cell (4) is diverted  
20 by the transmitter element (5) to one side of the pilot burner (2), and the heat exchanger (6) is shaped with a flat connecting part (6c) to the thermoelectric cell (4), and a heat sink member (6a ) attached to the flat part (6c), which extends in the direction of the space (H,L)  
25 situated under the apparatus support bracket (8).

4.- Apparatus for detecting gas combustion adapted to a domestic free-standing gas heater or a water heater provided with a safety valve (16), a main gas valve (17) and an electronic control unit, the detection apparatus

5 (1') comprising,

a mounting bracket (8') for supporting the detection apparatus (1') shaped for fitting on the gas heater or the water heater,

a pilot burner (2) with at least one pilot flame (3) for

10 faulty combustion detection, and an igniter (10) incorporated on the support bracket (8'),

a thermoelectric generator assembly (20-26) heated by the pilot flame (3), supplying through two electric outputs (13,12) respectively, a low voltage (Vb) for energizing

15 said safety valve (16) and for detection of combustion deficiencies in the pilot flame (3), and a higher voltage (Vd) for powering the main valve (17) and the electronic unit of the gas heater,

wherein the thermoelectric assembly (20-26) is

20 incorporated on said support bracket (8') forming a compact mounting unit with the pilot burner (2), and includes two flat thermoelectric cells (20,21) made up with semiconductor p-n junctions, each one provided with one of said electrical outputs (13,12), a heat

25 transmission element (25) which is licked by the pilot flame (3), a heat sink (22) to the environment forming a thermal path (25,21,20,22) shared by both thermoelectric

cells (20,21), and thermal connection means (24,26) between both cells (20,21).

5.- The gas combustion detection apparatus according to  
5 claim 4, wherein said two thermoelectric cells (20,21)  
are of different areas from each other, one larger and  
one smaller, whose hot cold sides are made up of flat  
insulating plates (20c-21h), and both cells (20,21) are  
mounted in an overlapping position in thermal contact  
10 with each other, forming said shared thermal path  
(25,21,20,22) between said heat transmission element (25)  
connected to the hot plate (21h) of the smaller cell  
(21), and said heat sink (22) connected to the cold plate  
(20c) of the larger cell (20).

15

6.- The gas combustion detection apparatus according to  
claim 4, wherein both thermoelectric cells (20,21) are of  
different areas, one larger and one smaller, and are  
overlapping, connected thermally to each other with an  
20 aligned side edge, while a part of the larger cell (20)  
is left free for the tensioned engagement of a spring  
element (23), which secures the two cells (20,21) up  
against the heat sink (22).

25 7.- The gas combustion detection apparatus according to  
claim 4, wherein both flat thermoelectric cells (20,21)  
are each built with two outer insulating plates (20c-21h)

parallel to each other, and said thermal connection means (24,26) of both cells (20,21) for transmitting heat between them comprise a thermal connecting layer (26) between two superimposed plates (20h,21c) of both cells  
5 and at least one heat bridge in the form of a copper bar (24) built into one of the cells (21) for the direct transmission of part of the heat received by this first cell (21) to the other second cell (20), in order said low voltage (Vb) to be removed by cooling said first cell  
10 (21) up to the safety valve shutoff, at a time response quicker than 10 s.

8.- The gas combustion detection apparatus according to claim 4, wherein the above-mentioned heat sink (22) is  
15 metallic with natural ventilation fins, and it is provided with two side legs (22b) for its attachment to the support bracket (8') of the detection apparatus, said heat sink (22) forming a compact housing for installing and covering the thermoelectric cells (20,21).

20

9.- The gas combustion detection apparatus according to claim 4, wherein both thermoelectric cells (20,21) being of different areas, one larger and one smaller, and connected thermally to each other, said heat transmission  
25 element (25) has at one end a thermal head (25a) licked by the pilot flame (3) positioned at a given separation distance (e') from the pilot burner jet (2a), and at the

other end is thermally connected to the smaller cell (21), for a rapid rise of said low detection voltage ( $V_b$ ) generated for energising said safety valve (16) in a time ( $t$ ) of less than 5 s since the pilot burner ignition.